

THE EMERGING ROLE OF INFORMATION SCIENCE IN BIOMEDICAL SECTOR

Misba Fayaz

Raiganj University, West Bengal

Abstract

In the present study, we envisage the emerging role of information science in biomedical sector. The information science has grown rapidly in last few decades and there has been large number of applications. In medical sector, the principle of information science can be used to diagnosis, medical record management, treatment etc. Hence, the role of information sciences are growing instantly hence the present study is designed to present the roles of information sciences in biomedical sector.

Keywords: *Information science, Biomedical, Applications, Role in health sciences*

1. INTRODUCTION

Biomedical Science involves the study of Biology and medicines so as to improve the health of both animals and humans. Using information technology (IT) to aid medical research will lead to improvements in the health care systems. These technologies will allow medical researchers to determine the effectiveness of a particular treatment and discover the harmful side-effects of a drug. The medical professionals can have lots of data sets using these technologies that will enable them to quickly access the pros and cons of a particular medicine, drug or a testing method. Similarly, it will enable easy dispersion of knowledge among the medical students that will ease their learning and discovery [1]. Though the research is generally carried out in private sector, investments from the public sector will play a major role. Hence, many developed countries have announced initiatives to modernize their health care systems with investments in health information technology (IT). The goal of these initiatives is to use technology to improve the health care system by reducing costs, increasing patients' safety and providing quality care. Improving health care is a common goal for every country, but there are wide disparities in the success with which nations have pursued their goals depending upon their capability to apply the knowledge of information technology in the field of medical science [2]. Also role of artificial intelligence is growing in different sectors like e learning, sports, medicine, e-automation etc [2,3]. In this case, the artificial intelligence can be used in diagnosis tool wherein the patient sample is processed and programmed accordingly to find the accuracy in the results and validate.

2. LITERATURE REVIEW

According to Castro, 2009, both the United States and the United Kingdom commit roughly the same percentage of total public medical research funds to health informatics. However, the benefits of the United Kingdom from advancements in health informatics research is significantly more compared to the United States. This is because of the United Kingdom's Supremacy in its transition to electronic health records among primary care providers. Further, the National Health Service (NHS) has made an important strategic decision to emphasize medical research as one of its core missions. Thus, as the NHS continues to develop its IT infrastructure, it will be able to support technical upgrades and policy changes to improve information sharing and its research information base. The United States presently lacks the capacity to turn its electronic health records into a usable database for medical research and hence the United States should develop the capability to share medical data for authorized research in an effective manner [4].

According to Ward, *et.al.*, 2001, if any institute does not benefit from information technology and communication networks, it will gradually fall off from the global communication. The health industry has therefore shifted towards applying information technology in its field and has been constantly taking effective steps towards benefitting from the latest technologies to increase health and improve clinical and financial results. In an announcement made in the 55th public session of the United Nations in September, 2000, and accepted by 189 member countries, information and communication technology was introduced as an important tool for achieving all the goals of this organization such as reducing poverty, correcting educational and health services, easy access to governmental services and improving the society's health level. Considering the importance of medical records as the most important information source in healthcare, the creation of electronic medical records plays a key role in improving the effectiveness of the health system and the study in the field of biomedical science [5].

According to Tayade and Kulkarni, 2007, Innovative medical technology & health education is essential for helping not only the students but also patients so that diseases can be cured rather than be managed. Further, this is also essential for the prevention of various diseases related to hygiene, communicable diseases, diseases caused due to addiction like lung cancer, oral cancer, liver cirrhosis etc. The scope of technology applications in the medical system in India will really make dramatic changes in future. The electronic health record tool is an electronic health record system that enables the healthcare personnel save time and money and improve the health condition of patients by organizing their records. Moreover, the diagnosis and treatment process will also be simplified. This tool combines traditional paper records with modern technological facilities for increasing the accuracy and speed of completing healthcare records. However, considering the sensitivity of the information, the confidentiality of the records is very important. Therefore, many countries have set policies for maintaining the confidentiality of the records differs between societies considering their social, economical, scientific, political and cultural conditions [6].

Similarly, According to the recent study conducted by Nadikattu et al., the machine learning tool can aid in management of breast cancer. The study reports the change in artificial intelligences and neural system calculations with the growth of malignant tumor at the early stages which can be helpful to manage the treatment and save patients life. The calculation was done using support vector machine, decision tree classification, Random forest classification and extreme learning machine and other tools. The study concluded that machine learning tools can be good enough to manage the breast cancer [7].

3. BENEFITS OF INFORMATION TECHNOLOGY IN BIOMEDICAL SCIENCE

The introduction of Information Technology in biomedical science has greatly expanded the knowledge of the medical professionals and students. Bringing together large sets of medical data and tools to analyze the data, offers the potential to a nation to expand the research capabilities of its doctors, scientists and pharmaceutical companies. Medical researchers can use this vast source of biological and clinical data to discover new treatments and better understand critical illnesses. Pharmaceutical companies can use the biomedical data to create drugs targeted at specific populations or specific illnesses. Health care providers can use the data to better inform their treatments and diagnoses and spread awareness so as to prevent the spread of communicable diseases [8].

Further, applying information technology to health care research creates the possibility of enabling rapid learning of the health applications, to aid in effective biomedical research and drug safety studies. This is because using this technology, the side-effects from drugs newly introduced in the market can be monitored in real time and necessary actions can be taken. Moreover, the risks and benefits of drugs can be studied for specific populations or for a specific cohort of people yielding more effective and safer treatment regimens for patients. Further, using rapid learning techniques can lead to substantial improvements in the quality and cost of care. By the conversion of the raw digital data into knowledge, these rapid learning health networks can enable doctors to better practice medicine based on evidence. Evidence based medicine is the use of treatments judged to be the best practice for a certain cohort of population on the basis of scientific evidence of expected benefits and risks. Cost savings in health care is a growing priority in many of the developed countries as their health care costs continue to rise with every passing day. By using rapid learning networks, health care workers can identify the most effective treatments given a patient's specific medical profile [9].

4. THE PRESENT AND FUTURE CONDITION OF BIOMEDICAL SCIENCE

The current biomedical science displays specific trends that are likely to continue at least for some time in the future. These trends generally include, the use of methods that can generate big data, experimental methods for analyses of new drugs on a certain cohort of population, computational modeling of complex biological systems and advanced understanding of the structure and function of biologically relevant elements and their role in health and disease. Considering the progress achieved in the field of nanotechnology, it can be predicted that nanotechnology will play an important role in the field of science in general and in biomedical science in particular. Furthermore, certain trends in contemporary sciences suggest that boundaries between biomedical sciences will become less distinct and they will eventually converge into a limited number of highly disciplined fields of biomedical science [10]. A dominant position in biomedical sciences will be assumed by health researches that is midway between basic and clinical research and applies findings from basic biomedical sciences to prevent, predict or cure disease for the entire population. Achieving such a vision of an intelligent and fully-connected health care research infrastructure is yet to be achieved by all nations. For years, individuals in the research community have asked for increased coordination and interoperability among data repositories to advance the use of informatics in health care. They have also proposed various options to address interoperability although no proposal has achieved universal acceptance. A temporary solution has been the development of online communities that can share programming code to reduce the burden of working with diverse data sets. A good collection of open-source biomedical informatics projects that provide re-usable code for researchers is to use the automate common computing tasks. As an instance, the project includes modular programming code to alter DNA sequences or combine data sets from different data sources to make it compact [11].

5. PROBLEMS FACED WHILE IMPLEMENTING INFORMATION TECHNOLOGY IN BIOMEDICAL SCIENCE

While various projects have demonstrated the potential benefits that can emerge from the employment of informatics in health research and biomedical science, many technical problems still need to be solved. These obstacles include making data accessible, connecting existing data sources, and building better tools to analyze medical data to draw meaningful conclusions. Further, much medical research data is not accessible electronically. Electronic health records provide a complete medical history for a patient, including full details of the patient's illnesses, treatments, laboratory results, medication history and known allergies. This means that the full patient profile can be stored electronically and accessed anywhere. A necessary requirement for creating the underlying data sets needed for biomedical informatics research is to achieve the widespread use of electronic health records. The access to the electronic health records of large populations will help researchers apply informatics to various problems including clinical research, compare the effectiveness of the study, and drug safety monitoring [12]. However, collecting medical data in electronic format is only a basic step. Interoperability poses a substantial challenge for biomedical research. The vast amount of electronic medical data cannot be utilized fully by researchers because the data resides in different databases. Even when the organizations collect and distribute biomedical data, the incompatible data formats or data interfaces can create challenges for analyzing data across multiple data sets. As a result, researchers wishing to use multiple data sets must devote significant resources simply to manage the differences between the data and, as a result, have fewer resources available for working with the data. Hence, all such problems need to be addressed and promote the use of Information Technology in medical sciences by using the advanced tools of information sciences like cloud computing, human computing, nanoinformatics etc. The principle of nanoinformatics can be implemented in diagnosis tool as it is one of the emerging fields of science rapidly growing with converge of nanotechnology and information science [13].

6. CONCLUSION

The Information Technology has brought about a significant development in medical sciences. It has created large data sets that can be accessed globally though there are certain problems that limits its use. Again the coding problems don't have a solution that is universally accepted. The large data sets have to be made more accessible so that the widespread use can be promoted. The medical history of patients, their allergies, their illness records, the family history can all bring about a better treatment of the patients compared to the traditional method of treatments. Hence, information technology is essential to promote the progress of the biomedical science and make it a bigger goal of every nation to achieve it.

7. REFERENCES

1. Shortliffe, E.H., 2011, November. Biomedical informatics: defining the science and its role in health professional education. In *Symposium of the Austrian HCI and Usability Engineering Group* (pp. 711-714). Springer, Berlin, Heidelberg.
2. Feng, D.D. ed., 2011. *Biomedical information technology*. Academic Press.
3. Nadikattu, Rahul Reddy, Implementation of New Ways of Artificial Intelligence in Sports (May 14, 2020). Journal of Xidian University, Volume 14, Issue 5, 2020, Page No: 5983 - 5997. Available at SSRN: <https://ssrn.com/abstract=3620017> or <http://dx.doi.org/10.2139/ssrn.3620017>
4. Castro, D., 2009. 2009 Atlanta Conference on Science, Technology and Innovation Policy.
5. Ward, J.P., Gordon, J., Field, M.J. and Lehmann, H.P., 2001. Communication and information technology in medical education. *The Lancet*, 357(9258), pp.792-796.
6. Tayade, M.C. and Kulkarni, N.B., 2011. The Interface of technology and medical education in india: current trends and scope. *Indian Journal of Basic & Applied Medical Research*, 1(1), pp.8-12.
7. Nadikattu, Rahul Reddy, A Comparative Study between Simulation of Machine Learning and Extreme Learning Techniques on Breast Cancer Diagnosis (May 15, 2020). Available at SSRN: <https://ssrn.com/abstract=3615092> or <http://dx.doi.org/10.2139/ssrn.3615092>
8. Ryan, M., Mulholland, C.W. and Gilmore, W.S., 2000. Applications of computer-aided learning in biomedical sciences: considerations in design and evaluation. *British Journal of Biomedical Science*, 57(1), p.28.
9. Hah, S.S., 2009. Recent advances in biomedical applications of accelerator mass spectrometry. *Journal of biomedical science*, 16(1), p.54.
10. Leonelli, S., 2012. Introduction: Making sense of data-driven research in the biological and biomedical sciences.
11. Brass, E.P., 2009. Basic biomedical sciences and the future of medical education: implications for internal medicine. *Journal of general internal medicine*, 24(11), p.1251.
12. Alberts, B., Kirschner, M.W., Tilghman, S. and Varmus, H., 2015. Opinion: Addressing systemic problems in the biomedical research enterprise. *Proceedings of the National Academy of Sciences*, 112(7), pp.1912-1913.
13. Nadikattu, Rahul Reddy, The Emerging Role of Nano-informatics in America (May 30, 2020). Available at SSRN: <https://ssrn.com/abstract=3614535> or <http://dx.doi.org/10.2139/ssrn.3614535>